

Roscoe and W. J. Russell, on "Experiments suitable for Illustrating Elementary Instruction in Chemistry." These notes appear to me to be very useful as a rough guide to the school-teacher. But unless the teacher is able to arrange the experimental illustrations so that some conclusions regarding the elementary principles of chemistry shall be drawn from the results he obtains, which conclusions shall then be submitted to experimental examination, I think the notes will fail of their object.

It is to the want of progressiveness in the ordinary chemical course that I wish to draw attention.

The student of physics advances; he feels his way from one set of phenomena to another; he generalises, and gets hold of some principles on which he may rest. In the ordinary chemical course the student begins with enthusiasm; he is delighted with the experiments, and he takes a lively interest in the manipulative failures of the lecturer. But, after a little, the student finds that he is not progressing. When he has been told, and shown, the properties of hydrogen, oxygen, and water, he is expected to take as much interest as ever in hearing a list of properties of nitrogen and oxides of nitrogen. Then he fills his note-book with many facts regarding ammonia and nitric acid, and so on.

Now I do firmly believe that chemistry is a branch of science, and that it may be taught as such. I think it is possible, in a course of lectures on chemistry, to lead the fairly intelligent and not very idle student from simple facts about everyday occurrences to the difficult and apparently remote discussions regarding the architecture of molecules, in which chemists so much delight.

If lectures on chemistry were arranged so that principles should be discussed and amply illustrated by well-chosen experiments, instead of being (as I am afraid is still too often the case) repetitions of disconnected facts about a string of elements and compounds, I believe this branch of science would rapidly develop in this country. It seems to me that the distinction implied in the commonly-used terms *chemistry* and *chemical philosophy* is radically unsound. There are not two chemistries, but one chemistry. We do not speak of physics as different from natural philosophy.

What we want is to convince our students that they are dealing with realities. I am continually presented with answers to questions, which perhaps demand a knowledge of the laws of chemical combination, wherein a few elementary facts are elevated to the rank of an all-embracing theory, and complex structural formulæ are dealt with in a style of appalling familiarity, as if they were the topics which it is necessary to discuss on the very threshold of chemistry. One is told that chlorine is a monad, that is, it is a "one-armed one"; and then the conclusion is triumphantly announced, "*thus we see why it is*" that hydrogen and chlorine combine to form hydrochloric acid, and so on. The other day I implored a candidate in a certain examination to give me a reason for writing the formula of alcohol C_2H_5-OH rather than C_2H_6O ; he told me he had seen the former in a book. This is enough for the average student; and yet these people call themselves students of science. I am afraid the teachers are greatly to blame.

The examiners have undoubtedly much power; but I think the examinations in chemistry are improving as a whole.

When a lecturer in chemistry announces two series of lectures, one elementary and one advanced, is it not very often found that the advanced class is condemned to hear copious details regarding the purification and methods of separation of the rare metals, while the elementary class is entertained with an exhibition of the properties and reactions of the simple and compound gases? But is this chemistry?

I think that the teachers of chemistry must consent to abandon the time-honoured practice of placidly proceeding from element to element, and from compound to compound; they must ask themselves whether they know of any reasons why chemistry should be called a branch of natural science, and, having conscientiously answered this question, they must try to make their students really acquainted with these reasons.

Dr. Sydney Young (NATURE, vol. xxxi., p. 126) has referred to the paucity of good elementary text-books of chemistry. I, too, have felt the want of a really good book in attempting to teach the principles of chemistry to beginners. Is there any elementary book which treats chemistry as a genuine living science?

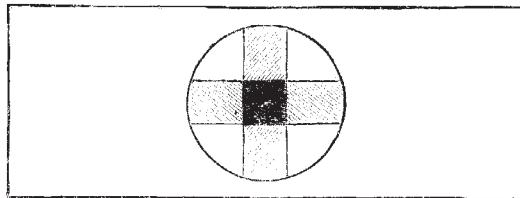
M. M. PATTISON MUIR

Cambridge, January 12

A Method of Isolating Blue Rays for Optical Work

In many optical experiments, e.g. in examining the dispersion of optic axes in crystals, a homogeneous or monochromatic light is required. A fairly homogeneous red light, nearly corresponding to the Fraunhofer line B, can be obtained by a properly-selected piece of red glass placed in front of a good Argand burner or paraffin lamp. For yellow light, nothing can be better than the flame of a Bunsen's burner in which a bead of sodium carbonate is held in a loop of platinum wire. For blue rays, the light transmitted by a solution of cuprammonium sulphate is generally recommended, since the ordinary blue glass coloured with cobalt invariably transmits red rays as well as blue. But the use of a glass cell containing a strong ammoniacal solution is often inconvenient and unpleasant.

I have met with a peculiar kind of greenish-blue glass, used for railway signal lamps, and known as "signal-green glass" (coloured, I believe, with copper in its divalent condition), which is remarkably opaque to the less refrangible rays nearly as far as Fraunhofer's line E, while it transmits a large quantity of blue and some green light. By combining a piece of this glass with a piece of rather deep-tinted cobalt glass, the red rays transmitted by the latter may be wholly stopped, and only the part of the



spectrum between F and G is transmitted, constituting a light at any rate not less homogeneous than that transmitted by solution of cuprammonium sulphate.

This "signal-green glass" is also useful in illustrating selective absorption of light by different media. If, for instance, a piece of it is superposed on a piece of properly-selected red glass, each absorbs what the other transmits, and practically no luminous rays survive the two; only a faint neutral-tinted light struggling through, even when strong sunlight is used.

This can be well shown on the screen by fixing a narrow strip of the "signal-green glass" vertically in a lantern-slide, and crossing it with a similar strip of red glass fixed horizontally in the same frame. The square space where the two overlap appears absolutely black.

The same arrangement is useful for other absorption-experiments, since the original colours of the media are shown, as well as the result of their superposition.

It is necessary to remember that much lighter tints are wanted for lantern-work than for subjective experiments.

Eton College, January 10

H. G. MADAN

Barrenness of the Pampas

In the admirable address of Prof. Asa Gray at Montreal, he alludes to the singular absence of trees and herbaceous plants throughout the Pampas or vast level plains of the South American continent, and he indorses the opinion of Mr. Darwin and Mr. Ball that this absence is due to the fact that the only country from which they could have been derived could not supply species adapted to the soil and climate. As this is a subject to which I paid considerable attention during a long residence in South America, I venture to call attention to the explanation of this phenomenon, which my observations gave rise to as described in my "Visit to South America," 1878.

The peculiar characteristics of these vast level plains which descend from the Andes to the great river basin in unbroken monotony, are the absence of rivers or water-storage, and the periodical occurrence of droughts, or "siccios," in the summer months. These conditions determine the singular character both of its flora and fauna.

The soil is naturally fertile and favourable for the growth of trees, and they grow luxuriantly wherever they are protected. The Eucalyptus is covering large tracts wherever it is inclosed, and willows, poplars, and the fig, surround every estancia when fenced in.

The open plains are covered with droves of horses and cattle, and overrun by numberless wild rodents, the original tenants of

the Pampas. During the long periods of drought which are so great a scourge to the country, these animals are starved by thousands, destroying, in their efforts to live, every vestige of vegetation. In one of these *siccios*, at the time of my visit, no less than 50,000 head of oxen and sheep and horses perished from starvation and thirst, after tearing deep out of the soil every trace of vegetation, including the wiry roots of the Pampas grass.

Under such circumstances the existence of an unprotected tree is impossible. The only plants that hold their own, in addition to the indestructible thistles, grasses, and clover, are a little herbaceous oxalis, producing viviparous buds of extraordinary vitality, a few poisonous species, such as the hemlock, and a few tough, thorny, dwarf acacias and wiry rushes, which even a starving rat refuses.

Although the cattle are a modern introduction, the numberless indigenous rodents must always have effectually prevented the introduction of any other species of plants, large tracts are still honeycombed by the ubiquitous *bisaccho*, a gigantic rabbit, and numerous other rodents still exist, including rats and mice, Pampas hares, and the great nutria and *carpincho* on the river-banks. That the dearth of plants is not due to the unsuitability of the subtropical species of the neighbouring zones, cannot hold good with respect to the fertile valleys of the Andes beyond Mendoza, where a magnificent hardy flora is found. Moreover, the extensive introduction of European plants which has taken place throughout the country has added nothing to the botany of the Pampas beyond a few species that are unassassable by cattle, such as the two species of thistle which are invading large districts, in spite of their constant destruction by the fires which always accompany the *siccios*.

EDWIN CLARK

Marlow, January 15

Japanese Magic Mirrors

IN your last week's issue (p. 249) appears a paragraph from a paper by Dr. H. Maruoka of Tokio on "The Magic Mirror of Japan," and reference is made to the interest these mirrors have excited, and the large number of writers and lecturers who have taken up the subject of their construction. I have read most of what has been written and stated upon the subject, and dissent from all that has come under my notice, especially the ingenious theories of non-continuous convexity of surface. My reason for dissent is that I have seen one, and for some time it was placed in my care by a friend who made it himself in this country.

He, and I have no doubt correctly, assumed that the difference in reflection was due to difference of density, and that by hammering the flat surfaces of the large letters on the back of the mirror, an increased density would be produced which would extend to the front of the mirror, which would then receive a slightly higher polish, sufficient to give the magical figures. From this reasoning he concluded that any metal which could be polished so as to reflect well could be treated in the same way with the same results.

His first experiment was with a half-crown piece, and the success was complete; he had the reverse rubbed down, until a perfectly smooth and polished surface was produced, the reflection from which, on white paper and with a strong light, showed the head of the obverse quite distinctly, but differing from the magic mirrors in this respect, that it was less bright than the other portion of the disk, because the coining-press would bring its greatest pressure upon the field and not upon the type.

T. C. A.

Edinburgh

Peculiar Ice-Forms

I INCLOSE a letter with which I have been favoured giving another case of the curious ice-structure lately described in NATURE. The circumstances are very similar to those of the other cases.

B. WOODSMITH

Hampstead, January 16

Regent Road, Leicester, January 13, 1885

DEAR SIR,—Pray excuse my troubling you with an extract from my note-book as to a peculiar form of ice which I saw on the morning of September 21, 1880. I started to descend from the *Æggi* horn hotel a little before 6, and when I suppose that I was about a thousand feet down, just before coming to the wood, I noticed some curious-looking ice just along the bottom

of the sloping sides of the path, which here runs in a shallow gulley two or three feet deep. The ice ran along the side of the path for some yards. I took up several pieces in my hands and examined them, and made a rough sketch, which I reproduce without any additions. The ice was made up of bundles of little rods about one-sixteenth of an inch in diameter and half an inch long. They were roundish and rough or fluted on their sides, and tapered at each end, and in some cases the ends finished with a little thread of ice about a quarter the thickness of the body of the rod. The rods stuck together and were a little curved, and formed roughly two layers, or tiers, one above the other. My note states that these bundles of ice-rods lifted up the dirt and small stones on the top of them. The day before there had been snow with a thaw.

My impression was at the time that water, rising through the ground and being frozen just before it reached the surface, gave rise to these peculiar ice-forms.

You are quite at liberty to make any use you please of this note.

I am, dear Sir, yours faithfully,

JOHN D. PAUL.

Iridescent Clouds

THE iridescent colours in clouds, observed in England and Scotland in December last, were also visible here December 8, 9, 10, and 12. On the first day, about 3 p.m., the coloured clouds were arranged in a horizontal layer about 20° high, between 20° and 80° azimuth west. In the half altitude a fine stripe broke forth from the background of the ordinary (but not dense) cumulonimbus.

The opinion of one of your correspondents that a connection exists between this and the sky-gloves of the last two years, is contradicted by the circumstance that the phenomenon has been observed here several times before, viz. 1871, February 22, March 1, May 10; 1874, January 13; 1875, February 17; 1881, December 27; 1882, January 11, February 22, July 13. I make the following extract from the observation of 1882, January 11, showing the peculiar changes in the colours:—at 3.30 p.m. (sun set at 3.20) extremely beautiful iridescent cirrostratus in south-west, in an altitude of 8°—12°. The upper borders, later also the lower, were red, with yellow brims, the rest of the borders and the inner parts very variegated and variable; the light red, commonly seen in mother-of-pearl, changed through crimson into blue-green, and then into grass-green. On some spots this change was repeated twice. The variation of the colours continued till after 4 o'clock; at 4.30 the colour was the ordinary red. The form of the clouds varied very slowly.

1881, December 27, an isolated brilliantly-coloured cloud was observed through two hours at least. A drawing of it by Dr. Reusch (in woodcut) is inserted in the Norwegian *Naturen* 1882, No. 1.

The most striking cases of this phenomenon have been observed here when mild and dry weather set in after frost.

H. GEELMUYDEN

University Observatory, Christiania, January 11

Solar Phenomenon

AS I see no record of what I witnessed on the afternoon of the 14th instant in NATURE of the 15th, I trouble you with this brief statement. At 3h. 20m. p.m. on that day I was struck by the appearance of the sun, which was crossed by a light stratus cloud of a clearly-defined outline, below which appeared what seemed a column of light of uniform width, down to the horizon, the width being somewhat less than the sun's diameter. By 3h. 30m. the definition of this parallel beam was less marked, but the sun presented to me the appearance of an oblong, suggesting three partially-superposed disks. Soon afterwards the sun was wholly obscured. The day had been cold, the temperature being never far from freezing-point in the shade. I have on former occasions, and in summer, seen the parallel beam striking upwards, once in association with a mock sun.

Valentines, Ilford

C. M. INGLEBY

A Cannibal Snake

WITH reference to 'notes as to Ophidiophagous snakes, which appeared at pp. 216, 269, 312, and 408 of the last volume of NATURE, I inclose a communication received by me this morn-